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HORSESHOE LAKE, BARRON AND POLK COUNTIES

2014 AQUATIC PLANT MANAGEMENT SUMMARY REPORT
WDNR WBIC: 2630100

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April 1, 2015

HORSESHOE LAKE IMPROVEMENT ASSOCIATION
TURTLE LAKE, WI 54889

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PREPARED FOR THE HORSESHOE LAKE IMPROVEMENT ASSOCIATION

INTRODUCTION

This report discusses aquatic plant management activities completed by the Horseshoe Lake Improvement Association (HLIA) and Lake Education and Planning Services (LEAPS) during the 2014 season and provides a proposed hybrid watermilfoil (HWM) control plan for 2015. The 2014 treatment proposal provides the Association with the information needed to contract with a certified aquatic herbicide applicator to complete the necessary WDNR permitting and herbicide treatment. The following list of education and management actions were completed in 2014.

- Pre-treatment aquatic plant survey
- Herbicide application
- Post-treatment aquatic plant survey
- Clean Boats Clean Waters
- Purple loosestrife survey and removal
- Eurasian watermilfoil weevil survey
- Fall HWM bed-mapping
- 2015 HWM management planning
- Citizen Lake Monitoring Network Water Quality Testing
- Informal Shoreline Survey for Disturbed and Natural Shoreline
- Lake Fair and Annual Meeting
- Update of 2010 Aquatic Plant Management Plan for 2015-19

Each of these actions will be summarized in the following sections of this report.

PRE-TREATMENT AQUATIC PLANT SURVEY, TREATMENT, AND POST-TREATMENT AQUATIC PLANT SURVEY

PRE-TREATMENT

A fall HWM bed-mapping survey completed on October 6th and 13th, 2013 identified 13 areas of high density HWM that totaled 2.54 acres and an additional 167 HWM plants outside of these areas (Figure 1). Based on this survey, 13 areas totaling 6.86 acres were proposed for chemical treatment in the spring of 2014 with granular 2, 4-D (Navigate) at a rate of 4.0 ppm (Figure 2). A 115 point pre-treatment survey set up by Endangered Resource Services (ERS) and completed on June 1 found that HWM was patchy in distribution but still occurred in all areas. During this survey HWM was found at 7 sites and recorded as a visual at 30 additional points. Because of this, it was decided that the proposed treatment would not be changed. During the pre-treatment survey, the littoral zone extended to a maximum of 17.0-ft with a mean and median depth for all plants at 8.2-ft and 8.0-ft respectively. HWM was found throughout the majority of the littoral zone in 2-11feet of water growing over organic and sandy muck.

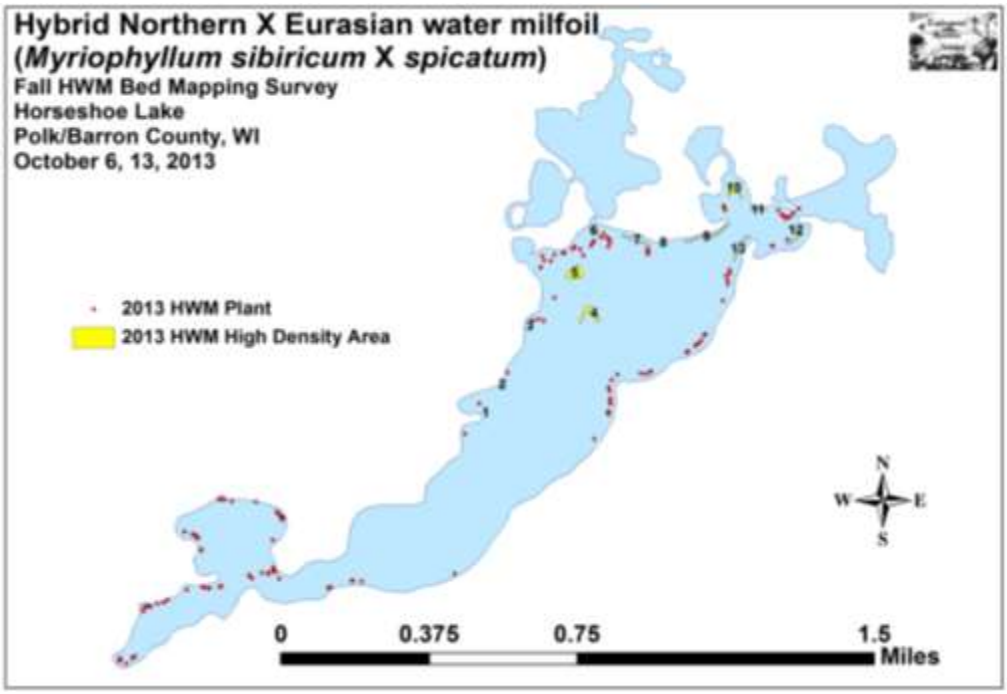

Figure 1: 2013 fall HWM bed-mapping results

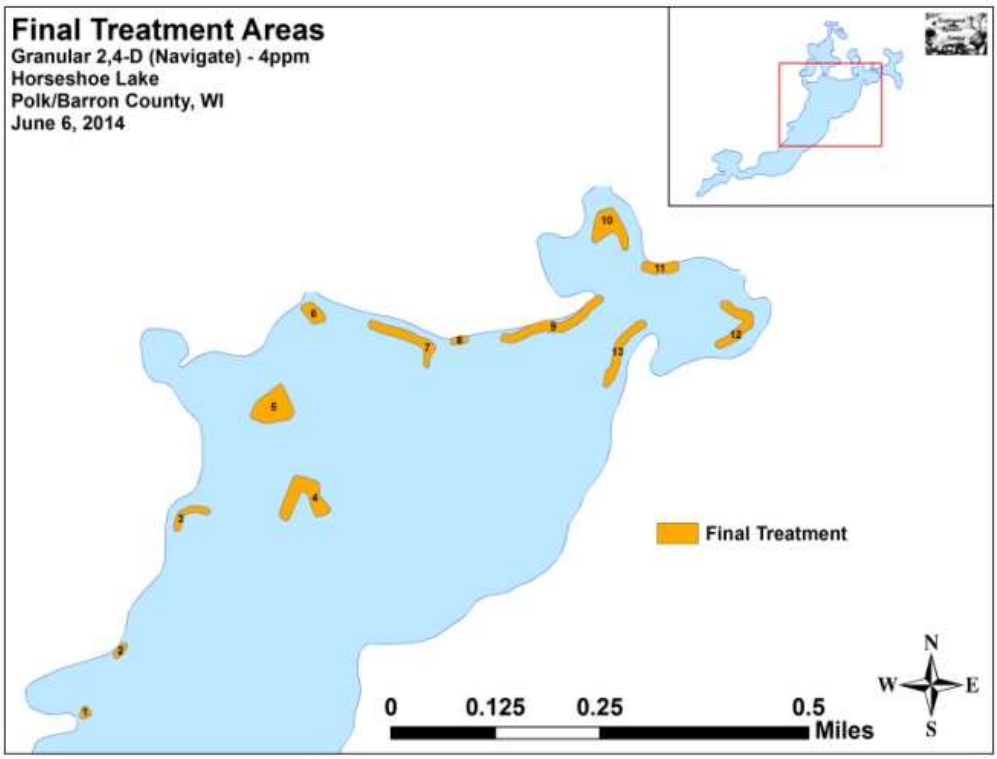

Figure 2: 2014 spring treatment areas totaling 6.86 acres

SPRING TREATMENT

Application of Navigate® herbicide was completed by Northern Aquatic Services (NAS) on June 6th. Surface water temperature was 72°F with little to no wind. A description of the sites and the amount of herbicide applied is in Table 1. At the time of application, HWM, white water lily, watershield, large-leaf pondweed, Robbins pondweed,

coontail, and common waterweed were present. Ideally, this treatment should have been completed earlier in the season when water temperatures were closer to 65°F.

Table 1: 2014 HWM Herbicide Management Details

2014 Horseshoe Lake Hybrid EWM Final Treatment Details 6-3-2014 (DLB)						
Name	Acres	Mean Depth (feet)	Acre-Feet	Target 2,4-D (ppm a.e.)	Navigate Application (pounds)	Navigate Dose (pounds/acre)
HDA 1-14	0.09	5.30	0.48	4.0	27.1	301
HDA 2-14	.11	6.70	0.74	4.0	41.9	381
HDA 3-14	.29	6.70	1.94	4.0	110.4	381
HDA 4-14	1.00	7.50	7.50	4.0	426.0	426
HDA 5-14	1.00	9.00	9.00	4.0	511.2	511
HDA 6-14	.30	4.10	1.23	4.0	69.9	233
HDA 7-14	.68	7.50	5.10	4.0	289.7	426
HDA 8-14	.11	4.90	0.54	4.0	30.6	278
HDA 9-14	.93	6.20	5.77	4.0	327.5	352
HDA 10-14	.77	4.50	3.47	4.0	196.8	256
HDA 11-14	.34	4.80	1.63	4.0	92.7	273
HDA 12-14	.63	3.60	2.27	4.0	128.8	204
HDA 13-14	.61	6.20	3.78	4.0	214.8	352
TOTAL	***6.86***		***43.44***		***2467.3***	

POST-TREATMENT

During the pre-treatment survey plant diversity within the beds was moderate with a Simpson Diversity Index of 0.73. This value increased to a moderately high 0.79 post-treatment. Mean native species richness at sites with vegetation was 1.86/site pre-treatment, and this value also increased to 2.14/site post-treatment. Mean total rake fullness at sites with vegetation increased slightly from 1.87 pre-treatment to 1.97 post-treatment. All pre and post treatment comparison statistics are in Table 2.

Table 2: 2014 Pre and Post Treatment Point-intercept Survey Statistics

Summary Statistics:	Pre	Post
Total number of points sampled	191	191
Total number of sites with vegetation	182	189
Total number of sites shallower than the maximum depth of plants	191	191
Frequency of occurrence at sites shallower than maximum depth of plants	95.3	99.0
Simpson Diversity Index	0.70	0.86
Floristic Quality Index	26.3	33.1
Maximum depth of plants (ft)	12.0	12.0
Mean depth of plants (ft)	6.1	5.8
Median depth of plants (ft)	6.0	6.0
Average number of all species per site (shallower than max depth)	1.56	2.37
Average number of all species per site (veg. sites only)	1.64	2.40
Average number of native species per site (shallower than max depth)	1.48	2.36
Average number of native species per site (veg. sites only)	1.56	2.39
Species richness	18	25
Mean rake fullness (veg. sites only)	2.06	2.01

During the post-treatment survey, no HWM was found in any of the treatment areas. This decrease in total HWM was moderately significant (Figure 3).

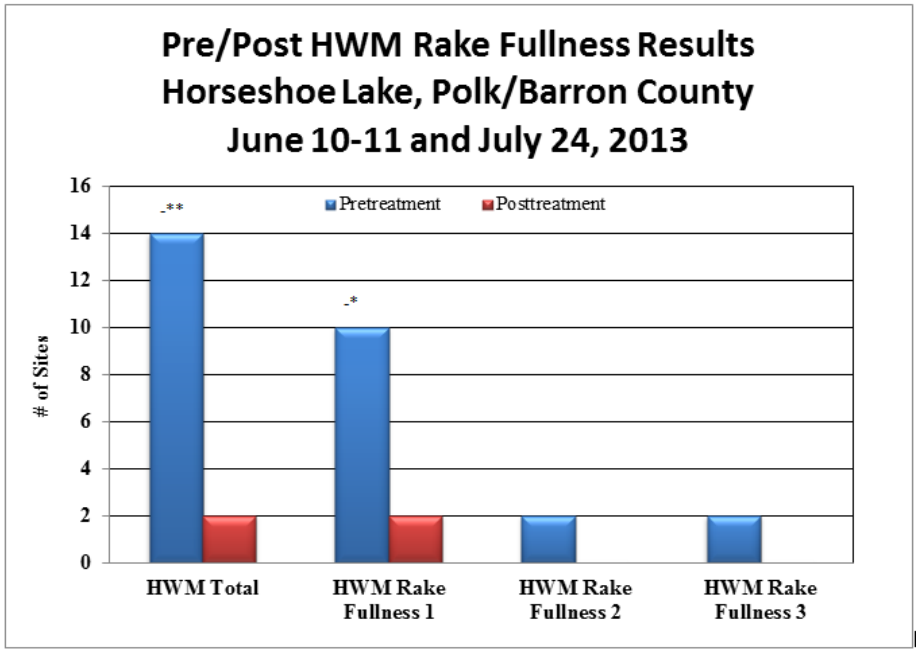

Figure 3: Pre/Post Changes in HWM Rake Fullness (ERS, 2013)

Fern pondweed and common waterweed were the two most common native species in both the pre and post-treatment surveys and neither showed a significant change post-treatment. No species other than HWM showed a significant decline post-treatment (Figure 11). Conversely, clasping-leaf pondweed showed a highly significant increase post-treatment, and small pondweed and wild celery showed moderately significant increases. More information related to the pre and post-treatment survey including species maps is available in Hybrid Eurasian X Northern water milfoil (*Myriophyllum spicatum* X *Myriophyllum sibiricum*) Pre/Posttreatment and Fall Bed Mapping Surveys Horseshoe Lake - WBIC: 2630100 Polk/Barron County, Wisconsin (Berg, 2014).

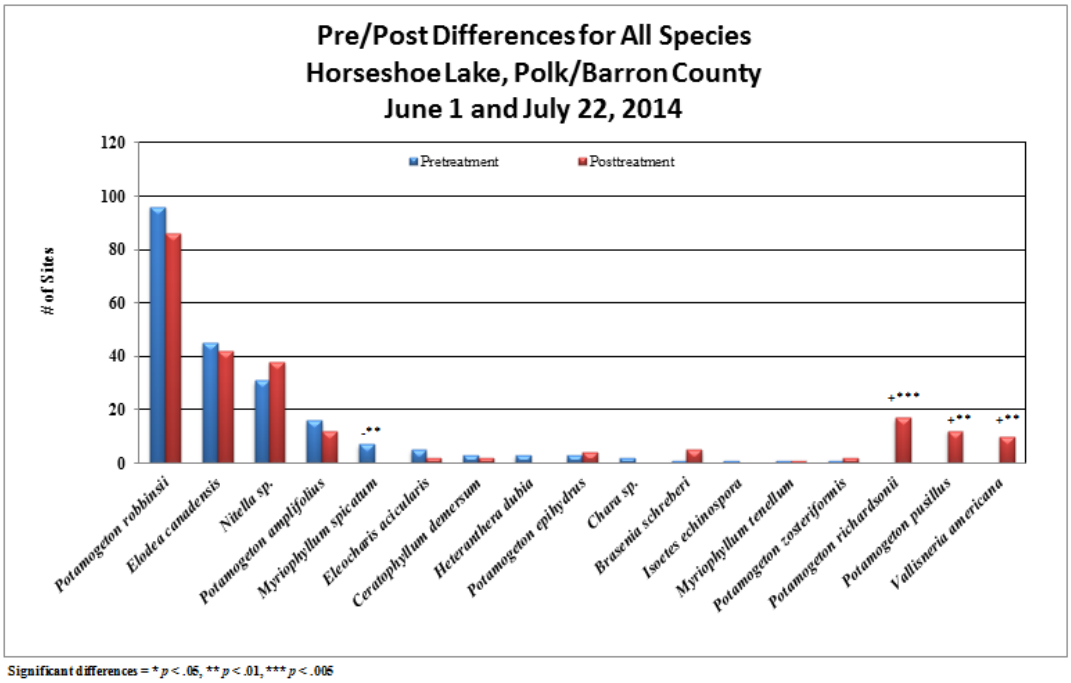

Figure 4: 2014 Pre/post changes in aquatic plants

CLEAN BOATS, CLEAN WATERS

There were 208 hours of watercraft inspection time at the Horseshoe Lake public boat landing recorded in the WDNR SWIMS database. Jack Sullivan and Pam Nelson completed the time.

PURPLE LOOSESTRIFE MONITORING, REMOVAL, AND BIOLOGICAL CONTROL

Purple loosestrife monitoring and physical removal was completed by HLIA volunteers in 2014. Volunteers searched for beetles locally but did not find any so no new beetles were brought back to the lake.

EWM WEEVIL MONITORING

EWM weevil monitoring was completed on July 30 and 31, 2014 by LEAPS. Stems were collected from three high density HWM areas in Horseshoe Lake. The results are documented in the following sections.

AREA ONE

53 stems of hybrid EWM were collected by hand from Area One (Figure 5) in the northwestern-most bay on the northeast shore on July 30, 2014. Fragments were put in ziplock bags and stored in a cooler and refrigerator until inspection was completed. Stem density in the area was sparse, but shoreland was close by with both disturbed and natural shoreline. Stem length was from approximately 15-40 inches. All 53 stems were inspected on July 31. No stage of the EWM weevil was identified. No adults, eggs, larva, or pupa were found, and no blast holes or stem damage were noticed.

Figure 5: 2014 EWM weevil survey, Area One.

AREA TWO

20 stems of hybrid EWM were collected by hand from Area Two (Figure 6) in the northeastern mid-section of the lake on July 30, 2014. Fragments were put in ziplock bags and stored in a cooler and refrigerator until inspection was completed. Stem density in this area was sparse with only a few stems or small clusters of stems. The shoreline in this area was completely natural, except there was a sand beach area of approximately 5-ft between the waters' edge and natural ground cover. Stem length was from approximately 15-40 inches. All 20 stems were inspected on July 31. No stage of the EWM weevil was identified. No adults, eggs, larva, or pupa were found. One blast hole was identified, but no other stem damage was noticed.

Figure 6: 2014 EWM weevil survey, Area Two

AREA THREE

30 stems of hybrid EWM were collected by hand from Area Three (Figure 7) just inside the small bay on northeastern end of the lake on July 30, 2014. Fragments were put in ziplock bags and stored in a cooler and refrigerator until inspection was completed. Stem density in this area was moderate with dozens of individual plants and small clusters. This was the only area on the lake that even approached "bed status". The shoreline in this area was completely natural. Stem length was from approximately 15-40 inches. All 30 stems were inspected on July 31. No stage of the EWM weevil was identified. No adults, eggs, larva, or pupa were found. No blast holes or any other stem damage was noticed.

Figure 7: 2014 EWM weevil survey, Area Three

More than 100 stems were collected and inspected looking for the presence or indicators of the presence of EWM weevils (Figure 8). None were found.

Figure 8: 2014 EWM weevil inspection completed by LEAPS

2014 FALL HWM BED-MAPPING

A fall HWM bed-mapping survey was completed on October 6, 2014 by ERS and although HWM was almost impossible to find anywhere in the lake during the 2014 post-treatment survey, it had become considerably more widespread in October. Fourteen high density HWM areas that totaled 1.13 acres and an additional 75 HWM plants outside of these areas were mapped (Figure 9). This was considerably less than what was found in the fall of 2013.

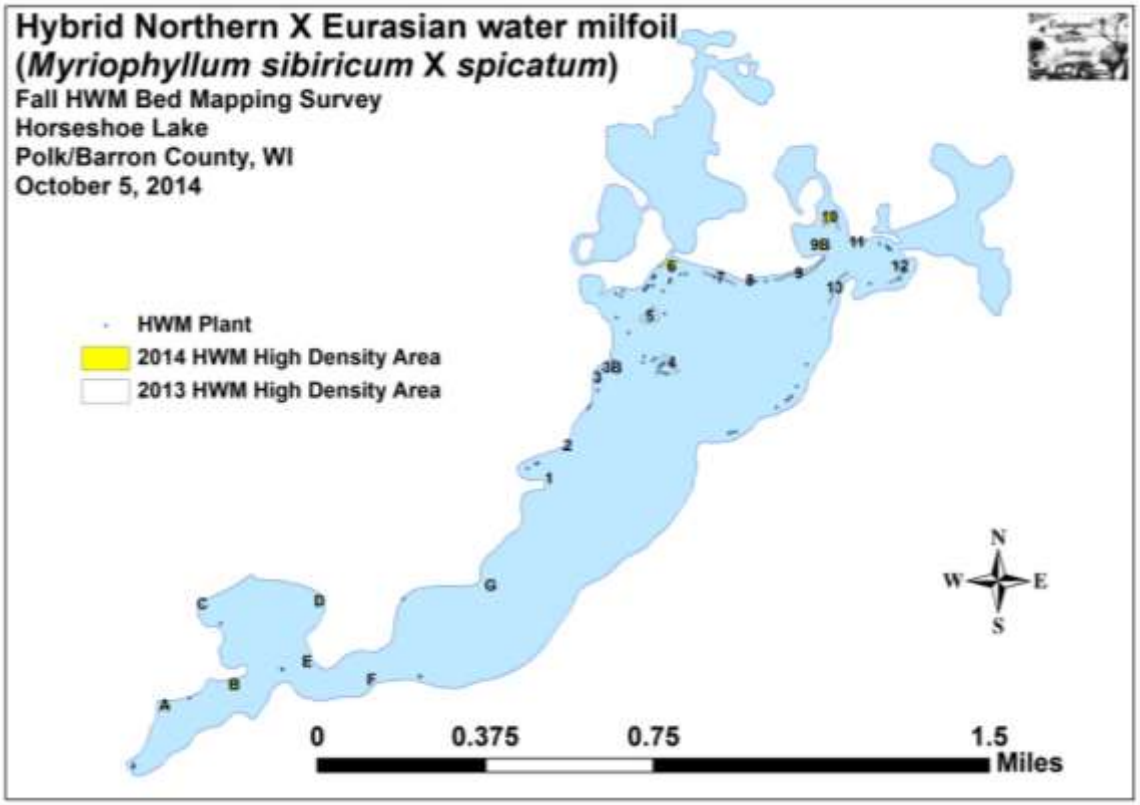

Figure 9: October 2014 fall HWM survey results

HDA A is one of the worst areas on the lake, currently directly in front of the public boat landing. Incoming and outgoing boats must travel directly through the "bed", and, with many plants being prop-clipped, it seems this area is facilitating the spread of HWM in the lake. Perhaps more concerning, it also threatens to spread HWM to other nearby lakes if boaters aren't careful to clean their trailers and motors.

HDA B was the second worst area on the west side with clusters and individual plants radiating away from the center in all directions. Plants began in 2ft of water near shore where they were mixed in with clasping-leaf pondweed and watershield. They were also found scattered at low densities to 8-ft among beds of fern pondweed.

HDAs C and D seem to be collecting fragments that are drifting in from the southern part of the bay. Control here makes sense, but only if Areas B and E are also dealt with to eliminate the source populations.

HDAs E, F, and G are small, but they had 10's of plants each and appear to be spreading.

HDAs 1, 2, 3, and 3B were more a collection of patches than a continuous treatable bed.

HDA 4 is the area around the now sunken rock island and had very low numbers of HWM plants. They were established over sandy muck on the edge of the drop-off in 6-10ft of water.

HDA 5 had almost no HWM; however, the bay/shoreline west/northwest of here saw an uptick in individual plants and small clusters.

In HDAs 6, 9B, and 10 HWM was present in shallow water from 4-6ft deep. Many of these plants appeared to be recent sprouts as they were generally single-stemmed and only 1-2ft tall/not yet canopied. The exception to this was areas of 9B which was one of the worst areas on the lake.

In HDAs 7-9, 11, 12 and 13, HWM was almost eliminated in 2014.

2015 HWM PRELIMINARY MANAGEMENT PLANNING

A HWM treatment proposal has been made for 2015 that includes 17 beds totaling 3.89 acres using Navigate granular herbicide at 3.5 - 4.0 ppm and 1 bed of 2.1 acres using DMA 4, a liquid herbicide with the same active ingredient (2,4-D), at 3.5 ppm. The concentration of herbicide used depends on bed size and average depth of the treatment area (Table 3, Figure 10). Larger treatment areas (>1.5 acres) may be treated with liquid 2,4-D herbicide rather than granular. The HWM treatment for 2015 was proposed prior to modifications in the management criteria necessary to consider the use of aquatic herbicides, but does generally follow the new guidelines being suggested in the new APM Plan. The new APM Plan has not been approved by the HLIA or the WDNR so management in 2015 still falls under the guise of the existing APM Plan written in 2010. Future HWM management proposals will follow guidelines ultimately approved in the new APM Plan. Aquatic plant survey work to support management will be similar to past survey work, although the post-treatment survey will likely be combined with a bed mapping survey and done later in the season. Fall HWM bed-mapping would then be discontinued.

Table 3: 2015 Proposed HWM Herbicide Management Proposal

2015 Horseshoe Lake Hybrid EWM Preliminary Treatment Proposal Details (3-30-2015 LEAPS)							
Name	Acres	Mean Depth (feet)	Acre-Feet	Target 2,4-D (ppm a.e.)	Navigate Application (pounds)	Navigate Dose (pounds/acre)	Notes
HDA 1-15	0.05	7.50	0.38	4.0	21.3	426	granular
HDA 2-15	.20	7.50	1.50	4.0	85.2	426	granular
HDA 3-15	.30	6.50	1.95	3.5	96.9	323	granular
HDA 4-15	.02	6.50	0.13	4.0	7.4	369	granular
HDA 5-15	.11	6.50	0.72	4.0	40.6	369	granular
HDA 6-16	.11	6.50	0.72	4.0	40.6	369	granular
HDA 7-15	.04	6.50	0.26	4.0	14.8	369	granular
HDA 8-15	.05	6.50	0.33	4.0	18.5	369	granular
HDA 9-15	.04	5.30	0.21	4.0	12.0	301	granular
HDA 10-15	.11	6.50	0.72	4.0	40.6	369	granular
HDA 11-15	.50	6.70	3.35	3.5	166.5	333	granular
HDA 12-15	.67	7.50	5.03	3.5	249.7	373	granular
HDA 13-15	2.10	6.50	13.65	3.5	34.0 (gallons)	16.0 gal/acre	liquid (DMA 4)
HDA 14-15	.17	7.50	1.28	4.0	72.4	426	granular
HDA 15-15	.50	7.50	3.75	3.5	186.4	373	granular
HDA 16-15	.41	4.50	1.85	3.5	91.7	224	granular
HDA 17-15	.47	6.50	3.06	3.5	151.8	323	granular
HDA 18-15	.14	6.50	0.91	4.0	51.7	369	granular
TOTAL	***5.99***		***39.76***		***1348.2***		

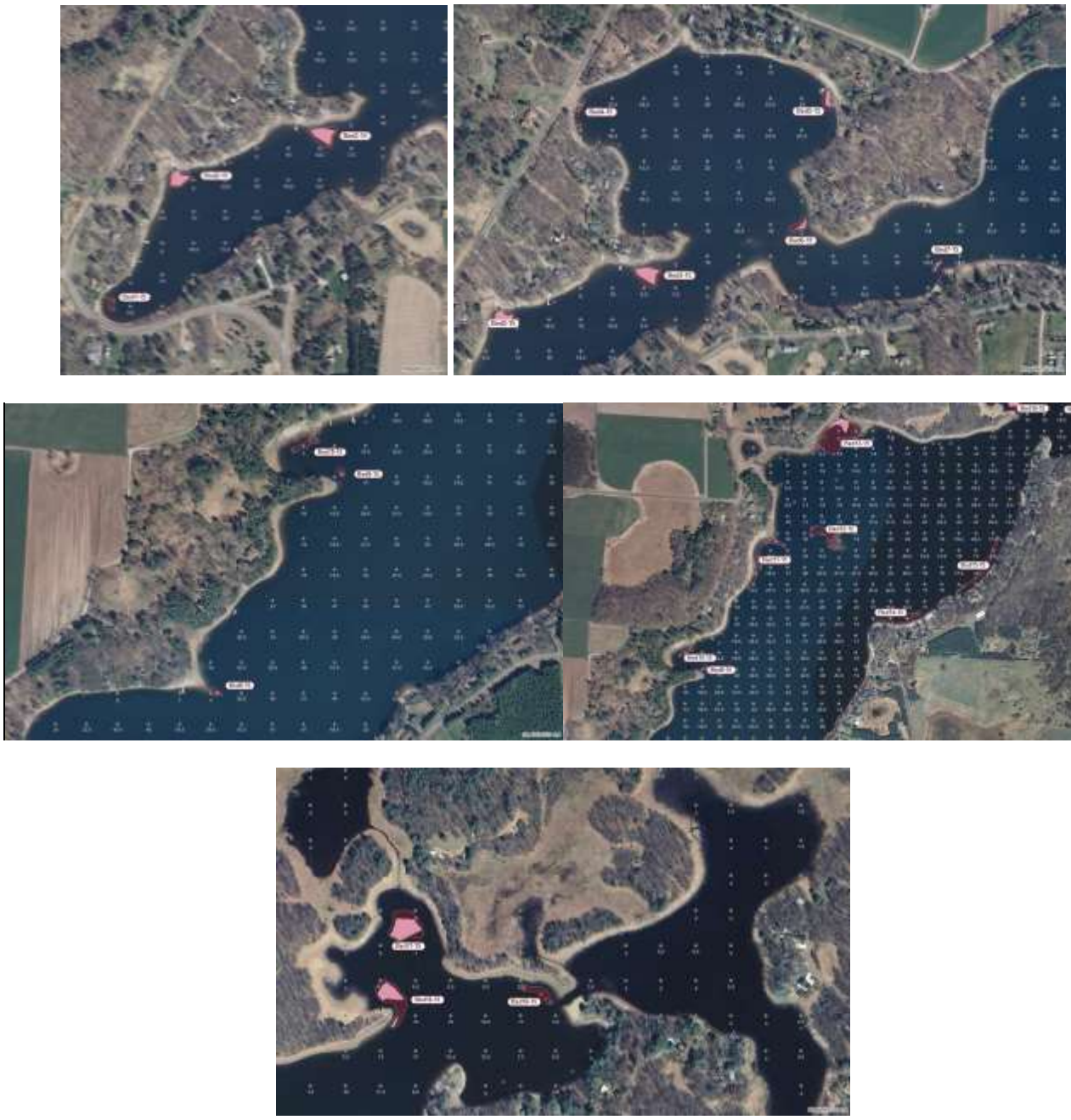

Figure 10: 2015 Proposed treatment areas

A WDNR permit request for herbicide application is currently being prepared by Northern Aquatic Services and the HLIA for HWM treatment in 2015.

CITIZEN LAKE MONITORING NETWORK (CLMN) WATER QUALITY TESTING

Figure 11 shows the average summer (July-August) Secchi disk readings since CLMN began. In 2014, the average summer (July-Aug) Secchi disk reading for Horseshoe Lake at the Deep Hole was 9.33 feet. The average for the Northwest Georegion was 8.4 feet. Typically the summer (July-Aug) water was reported as CLEAR and GREEN. This suggests that the Secchi depth may be mostly impacted by algae. Algal blooms are generally considered to decrease the aesthetic appeal of a lake because people prefer clearer water to swim in and look at. Algae are always present in a balanced lake ecosystem. They are the photosynthetic basis of the food web. Algae are eaten by zooplankton, which are in turn eaten by fish.

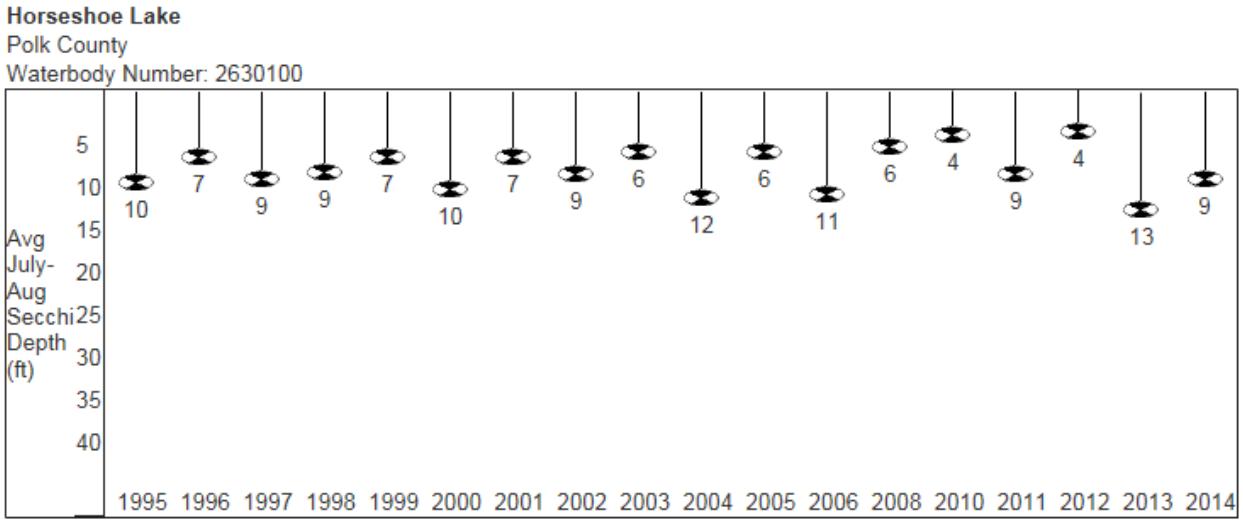

Figure 11: Average summer (July and August) Secchi disk readings at the Deep Hole

Additional Secchi disk readings of water clarity were taken at three other locations in Horseshoe Lake in 2014: Buchwald Bay, Mid Lake, and in the West Bay. In general water clarity in Mid Lake and in the West Bay mirror what is found at the Deep Hole. However, water clarity in Buchwald Bay was consistently about 6 feet in both years. Water color is generally considered brown in this bay indicating tannins in the water that limit light penetration.

CLMN chemistry data collected in 2014 at the Deep Hole in Horseshoe Lake showed an average summer Chlorophyll level of 8.78µg/l (compared to a Northwest Georegion summer average of 16.6µg/l). The summer Total Phosphorus average for 2014 was 15.25µg/l. Lakes that have more than 20µg/l of total phosphorus may experience noticeable algae blooms.

Figure 12 shows the average summer Trophic State Index (TSI) value for total phosphorus, chlorophyll, and Secchi disk readings. The overall Trophic State Index in 2014 (based on chlorophyll) for the Deep Hole in Horseshoe Lake was 51. The TSI suggests that Horseshoe Lake at the Deep Hole in 2014 was eutrophic. This TSI usually suggests decreased clarity, fewer algal species, oxygen-depleted bottom waters during the summer, plant overgrowth evident, and a warm-water fishery (pike, perch, bass, etc.) only.

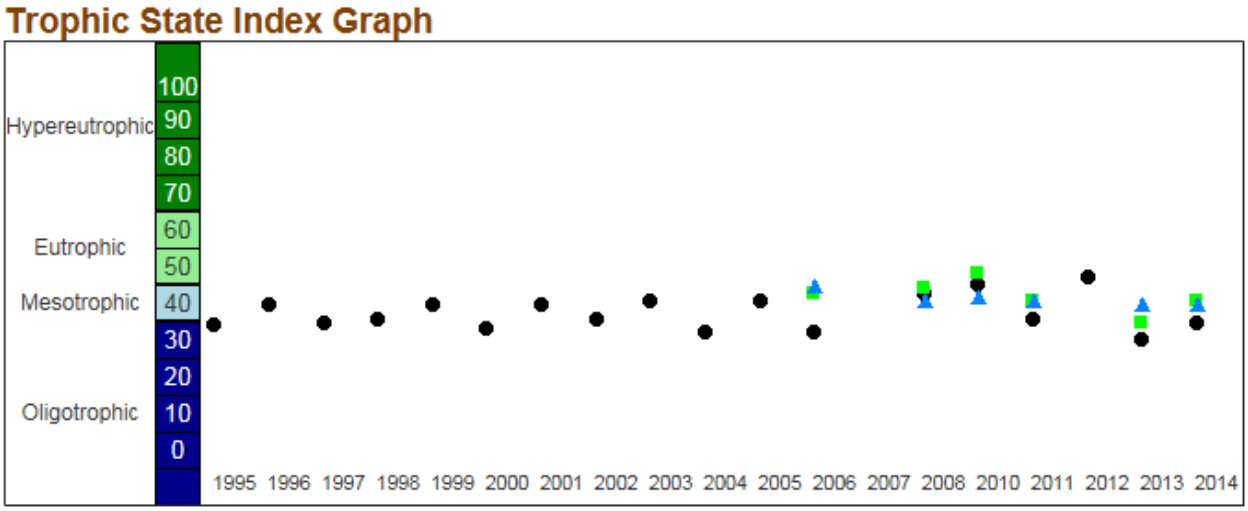

Figure 12: Summer (July and August) TSI values for total phosphorus and chlorophyll-a at the Deep Hole on Horseshoe Lake

INFORMAL SHORELINE SURVEY FOR DISTURBED AND NATURAL SHORELINE

On August 29, 2014, a day prior to the HLIA Lake Fair and Annual Meeting LEAPS completed an informal photographic survey of the shoreline of Horseshoe Lake to loosely document disturbed and natural shoreline. Photos were taken and then shared with property owners at the Annual Meeting. Some discussion about what is a healthy shoreline and what isn't was had with meeting attendees. The new APM Plan recommends completing a formal shoreland inventory and then striving to reduce the amount of disturbed shoreline by 10% over the period the new APM Plan is implemented.

LAKE FAIR AND ANNUAL MEETING

The HLIA held its annual Lake Fair, Picnic, and Membership Meeting on August 30, 2014 from 9:00am to 2:00pm at the Turtle Lake Park Pavillion. Educational displays included aquatic invasive plant and animal species, native plant species, SNUBA diver removal, shoreland restoration and rain gardens, water quality monitoring equipment and materials, Clean Boats, Clean Waters, and general lake stewardship. The combined Lake Fair, picnic and meeting was attended by well over 50 people. The potluck picnic was awesome. Dave Blumer from Lake Education and Planning Services gave a short presentation during the meeting. A pdf or the powerpoint presentation he made is included in this document. Photo documentation of the Lake Fair and Meeting is included in Figure 13.

Figure 13: August 30, 2014 HLIA Lake Fair, Picnic, and Annual Meeting

FORMATION OF A LAKE DISTRICT

For the last several years the HLIA has been investigating the possibility of forming a Lake District to help manage AIS in the lake. The HLIA believes that WDNR grant support for future management planning and implementation will be limited and want to make sure they are able to take care of the lake in the future regardless of the status of grant support. A committee was formed in late 2013, charged with finding out more information about forming a Lake District and sharing that information with HLIA constituency. A presentation was made at the Annual Meeting in 2014 and efforts continue in 2015. It is not known when a Lake District will be formally set up, but sometime in 2015 or 2016 is likely.

UPDATE OF 2010 AQUATIC PLANT MANAGEMENT PLAN FOR 2015-19

One of the last goals for the 2010 APM Plan was to repeat the 2008 whole-lake, point-intercept, aquatic plant survey in 2013 and then use that data to revise the existing plan in 2014 and 2015. A draft version of the new 2015-2019 APM Plan for Horseshoe Lake was submitted to the HLIA and the WDNR on March 31, 2015 for initial public review and informal review by the WDNR. Under the new APM Plan, the HLIA would likely not be eligible for WDNR AIS Established Infestation and Control grant funding, although they would be eligible to apply for AIS Education, Prevention, and Planning grant funding. The draft plan has been put on the HLIA webpage at http://www.hlake.org/.